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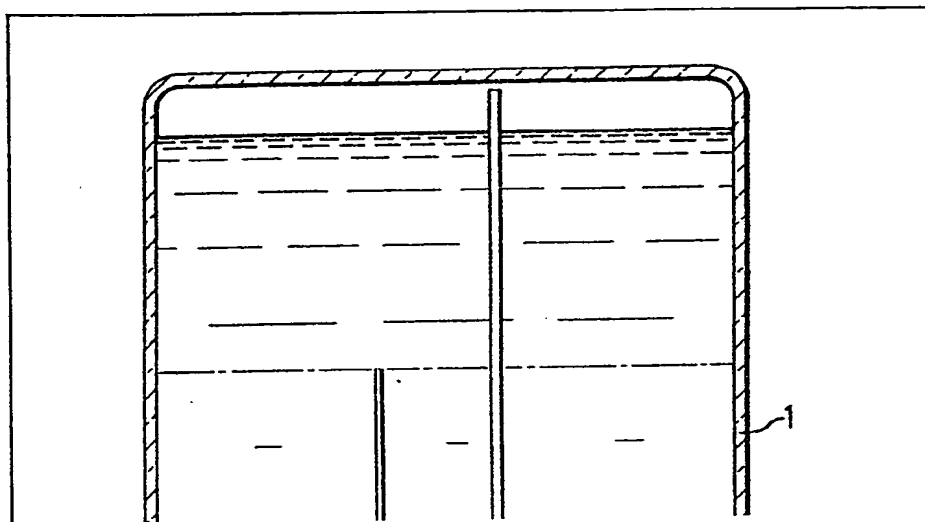
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(71) Applicant  
Moaffaqu Faig Abdul-Al-  
Razak, Kadumiya, House  
No. 15/77, Baghdad, Iraq  
(72) Inventor  
Moaffaqu Faig Abdul-Al-  
Razak  
(74) Agents  
F. J. Cleveland &  
Company, 40-43  
Chancery Lane, London  
WC2A 1JQ

## (54) Liquid dispensing apparatus

(57) This invention relates to liquid dispensing apparatus and comprises a tubular probe (10) for insertion into a bung (4) of a container (1) containing liquid (2) so that when the container is inverted to dispense liquid therefrom, some of the liquid flows down the probe (10). A terminal is provided in contact with liquid in the probe (10)

and another terminal is provided adjacent an inner wall of the bung (4) so that an electric circuit can be completed across the terminals through liquid in the probe (10) and liquid (2) in the container (1). When the level of the liquid falls below an inner end of the probe (10), the circuit is broken with a result that an audible alarm is sounded and means is actuated for inhibiting flow of liquid from the container (1).



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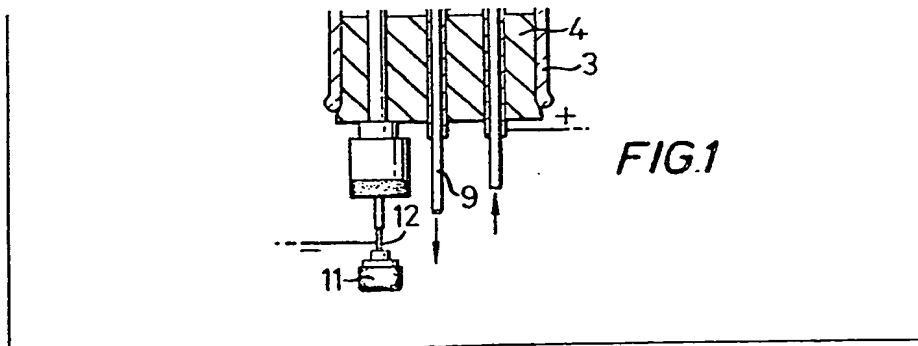
SPECIFICATION NO 2074545A

The following corrections were allowed under Section 117 on 18 June 1982:

Front page, Heading, (71) Applicant *for* Moaffaqu Faig Abdul-Al-Razak, *read* Mafaqe Faiqe Abdal Razak,

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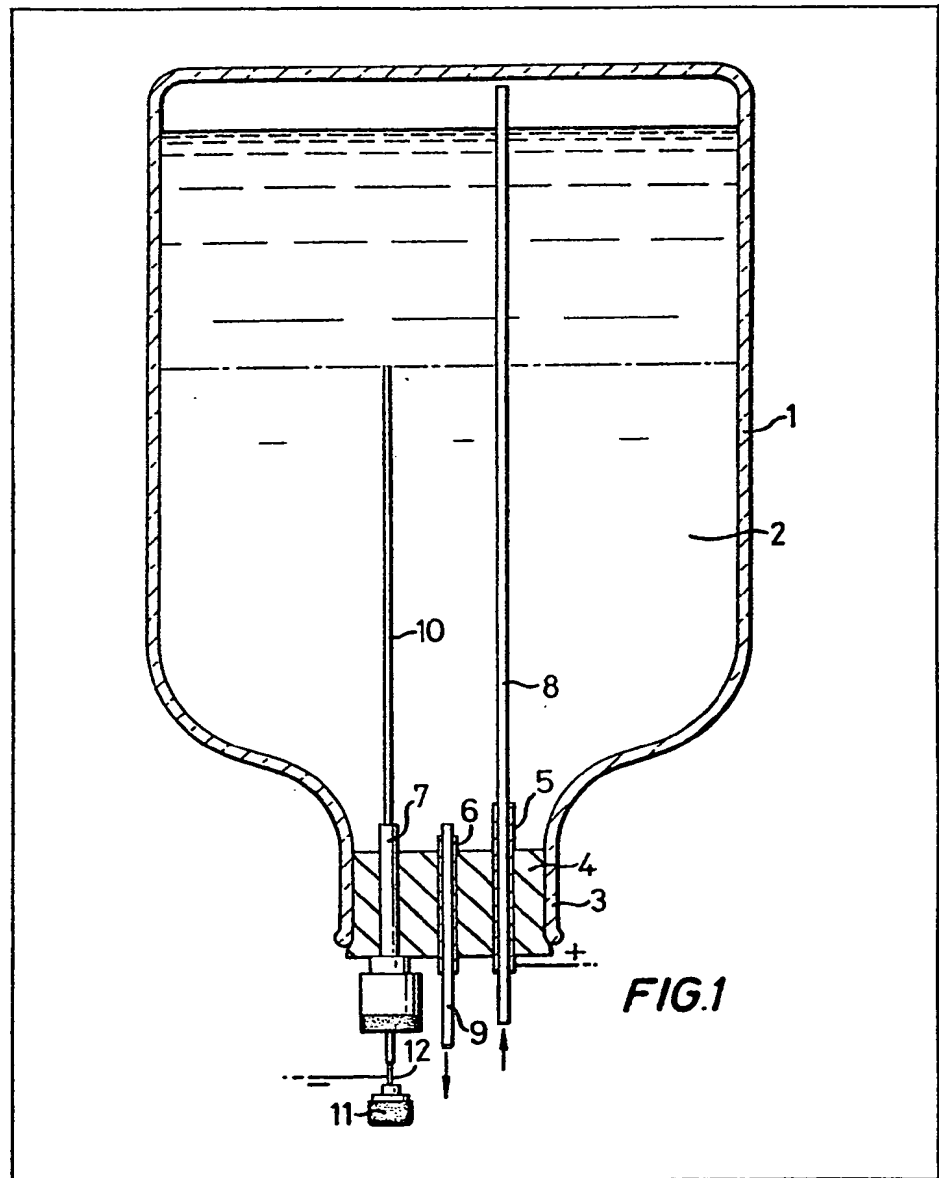
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## (54) Liquid dispensing apparatus

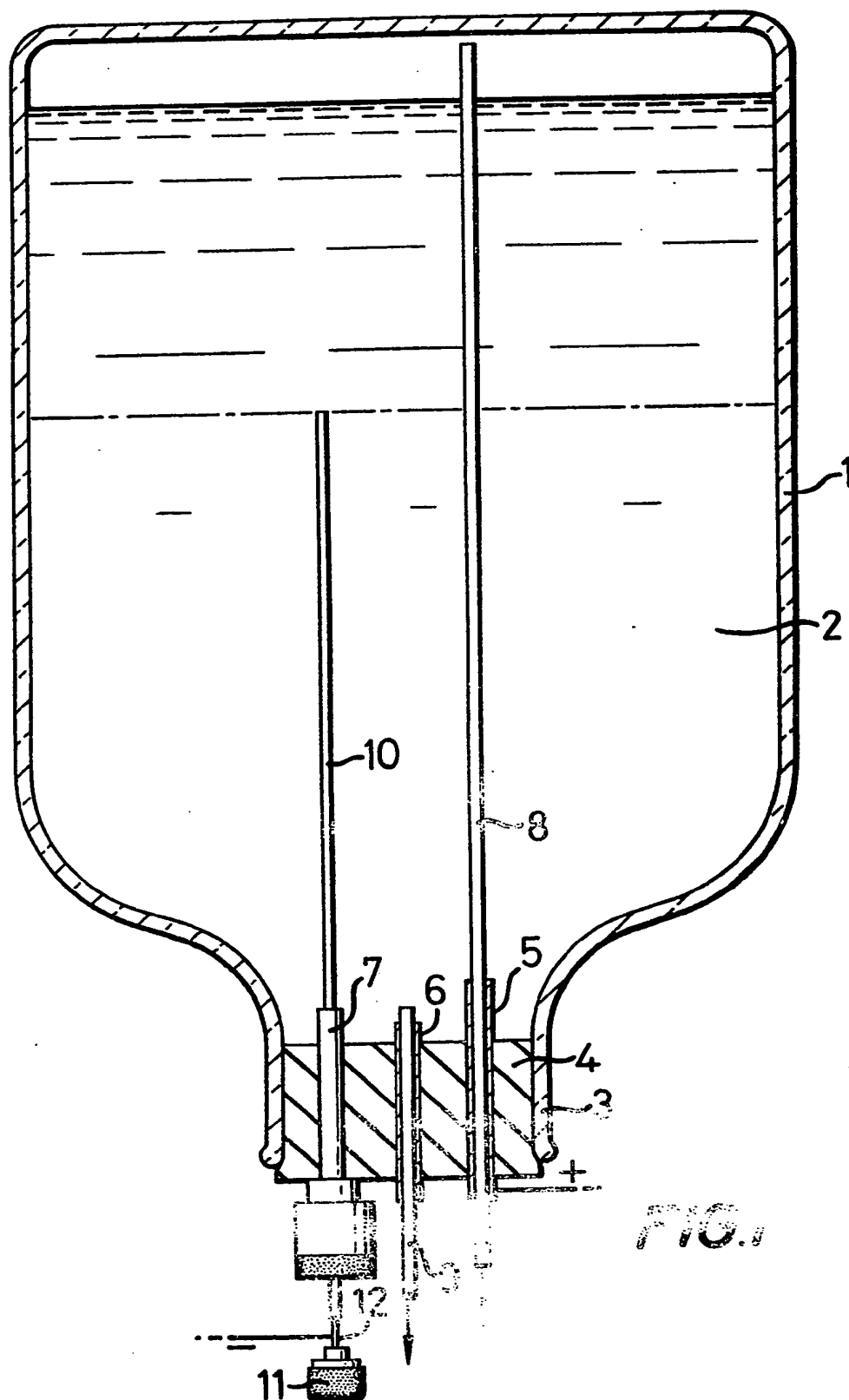
(57) This invention relates to liquid dispensing apparatus and comprises a tubular probe (10) for insertion into a bung (4) of a container (1) containing liquid (2) so that when the container is inverted to dispense liquid therefrom, some of the liquid flows down the probe (10). A terminal is provided in contact with liquid in the probe (10)

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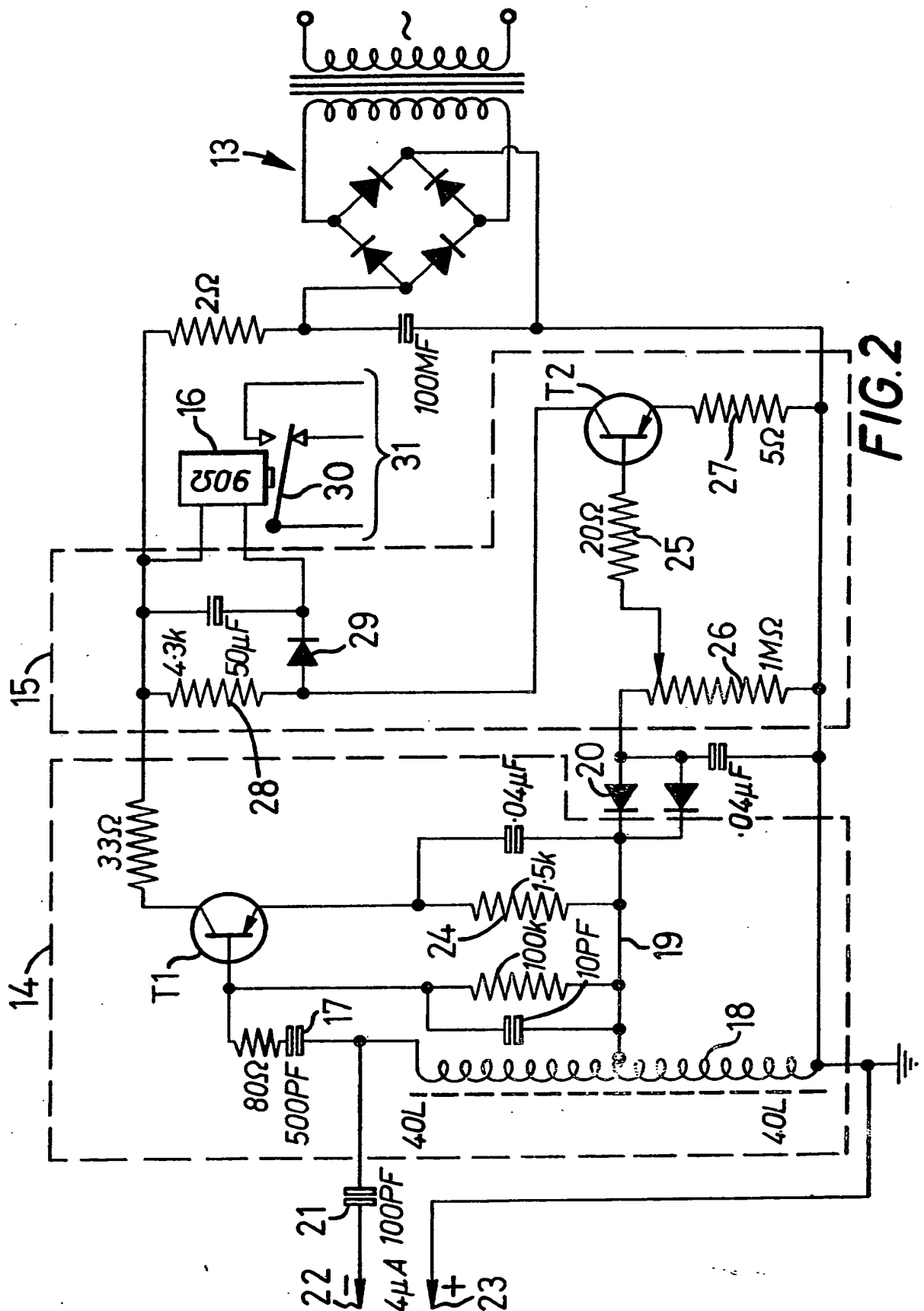


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**FIG. 2**

## SPECIFICATION

## Liquid dispensing apparatus

This invention relates to liquid dispensing apparatus and, more particularly, to apparatus for recording when a predetermined amount of liquid has been dispensed from a container.

It is known in hospital treatment of patients to provide bottles or bags containing liquid to be administered to patients. The liquid may be blood or solutions containing salt or glucose. The container, after the liquid has been inserted therein, is sealed by means of a plug. The container is prepared for use by inserting into the plug a pair of tubular needles so that the interior of the container is open to atmosphere through the tubular needles. A first tube is inserted through one of the needles so that an inner end of the tube is located adjacent a base of the container. A second tube is inserted through the second needle so that an inner end of the second tube is located adjacent an inner surface of the plug. The second tube is connected to a catheter which is inserted in an artery of a patient. The container then is inverted so that liquid flows through the second tube into the artery while air flows through the first tube into the container above the liquid.

It will be appreciated that containers are of standard capacity and the liquid inserted therein also is of standard volume. However, not all of the contents of a container may be required for dispensing to a patient.

It is therefore desirable to provide apparatus for recording when a predetermined amount of liquid has been dispensed from such a container.

According to the present invention, there is provided apparatus for recording when a predetermined amount of liquid has been dispensed from a container comprising:—

an elongate probe for inserting axially thereof into the container in a direction parallel to a direction of flow of liquid from the container,

means for establishing electrical connection between an innermost end portion of the probe when inserted into the container and liquid when contained in the container, and

means for detecting disconnection of said connection

so that when a predetermined amount of said liquid has been dispensed from the container, an electric signal is generated in the detection means.

Following is a description, by way of example only and with reference to the accompanying drawings, of one method of carrying the invention into effect.

In the drawings:—

FIGURE 1 is a diagrammatic representation of a container having apparatus in accordance with the present invention, and

FIGURE 2 is a circuit diagram of apparatus for detecting when the level of liquid in the container is at a predetermined position.

Referring to FIGURE 1, there is shown a container 1 for containing liquid 2, the container having a neck 3. The container is closed on

insertion of a plug 4 in the neck 2.

When liquid 2 in the container 1 is to be dispensed, the container is supported in an upright position, i.e. turned through 180° from the position shown in FIGURE 1, and three tubular metallic needles 5, 6 and 7 are inserted in the plug 4 and are located therein so that inner and outer end portions of the needles extend below a lower surface and above an upper surface of the plug 4. A tube 8 is inserted longitudinally of the needle 5 so that an inner end of the tube 8 is located adjacent an inner surface of a base of the container 1. A tube 9 is inserted longitudinally of the needle 6 so that an inner end of the tube 9 is located adjacent an inner surface of the plug 4. A tube 10 is inserted longitudinally of the needle 7 so that an inner end portion of the tube 10 is located at a predetermined distance from the inner surface of the plug 4. The tube 10 is blocked by means of a plug 11 having a metal pin 12 extending therefrom, the pin being inserted into an outer end portion of the tube 10 extending outwardly of the plug 4 so as to seal the outer end portion of the tube 10.

Referring now to FIGURE 2, the circuit for use with the container 1 comprises an electric power source 13, an oscillator 14, an amplifier 15 and a relay 16.

The oscillator 14 includes a transistor T1 the base of which is grounded via a capacitor 17 and a coil 18. The coil 18 is tapped intermediate the ends thereof by a line 19 connected to the cathode of a diode 20. The line connecting the capacitor 17 to the coil 18 has connected thereto a plate of a capacitor 21, the other plate of which is connected to a terminal 22. A second terminal 23 is connected to ground. The emitter of the transistor T1 is connected to a terminal of a resistor 24, the other terminal of which is tapped on the line 19. The collector of the transistor T1 is supplied by the —ve line from the power source 13.

The amplifier 15 includes a transistor T2 the base of which is connected to the anode of the diode 20 via a resistor 25 and a variable resistance 26. The emitter of the transistor T2 is connected to the —ve line from the power source 13 via a resistor 28. Output from the amplifier 15 is fed to the relay 16 via a diode 29.

The relay 16 has a contact 30 associated therewith, the contact 30 comprising a switch of an electric circuit 31 for controlling operation of an audible alarm device and means for inhibiting flow of liquid through the tube 9.

In use, the terminal 22 of the circuit shown in FIGURE 2 is connected to the pin 12 and the terminal 23 of the circuit is connected to the needle 5. The outer end of the tube 6 has connected thereto one end portion of a catheter, the other end of which is inserted in a blood vessel of a patient who is to receive liquid in the container 1. The container 1 is inverted to the position shown in FIGURE 1 and suspended from a suitable support (not shown). On inverting the container 1 to the position shown in FIGURE 1,

liquid inside the container passes down the tube 10 into contact with the pin 12.

When the power source 13 is switched on, supplying current at 0.9 mA and 8 V, the capacitor 21 is connected to ground via the terminal 22, the needle 5, the liquid in the container 1, the pin 12 and the terminal 23. In consequence, the oscillator is short circuited and is inactive.

The liquid in the container 1 is dispensed through the tube 9 to the patient and the level of the liquid in the container lowers towards the end of the tube 10 nearer the plug 11.

When the level of the liquid falls below the inner end of the tube 10, electrical connection between the liquid in the tube 10 and the needle 5 is broken. In consequence, the transistor T1 of the oscillator 14 is triggered and the oscillator is activated, output of the oscillator being rectified by the diode 20 and amplified by the amplifier 15 with a result that the relay 16 is energised causing the switch 30 to be operated in the circuit 31. The cut-off mechanism thus is operated preventing further flow of the liquid from the container 1 through the tube 9 and the alarm device is operated sounding an audible alarm. The circuit 5 may be de-activated by a doctor or nurse and the catheter removed from the patient.

The tube 10 preferably is of plastics material and is provided with indices spaced longitudinally thereof, the indices each being indicative of the volume of liquid to be dispensed from the container 1.

With such an arrangement the tube 10, prior to being inserted through the needle 7, is severed at an index mark indicating a selected amount of liquid to be dispensed from the container 1. When the tube 10 subsequently is inserted in the needle 7 and moved inwardly of the container 1 so that a predetermined index mark is adjacent an outer end surface of the needle 7, the inner end 11 of the tube 10 is located a predetermined distance from the inner surface of the plug 4. In this manner, when the apparatus is in use, cut off of the electrical connection through liquid contained in the tube 10 and the remaining liquid in the container 1 occurs at the instant that a predetermined amount of liquid has been dispensed from the container 1. At this instant, the oscillator 14 is activated and the circuit described in FIGURE 2 operates in the manner described

above.

The apparatus for cutting off supply of liquid through the tube 9 may comprise a solenoid operated valve, the solenoid being included in the circuit 31 and being arranged such that, when operated, the valve is actuated to close the tube 9.

#### CLAIMS

1. Apparatus for recording when a predetermined amount of liquid has been dispensed from a container comprising:—  
an elongate probe for insertion axially thereof into the container in a direction parallel to a direction of flow of liquid from the container,  
means for establishing electrical connection between an inner end portion of the probe when inserted into the container and liquid contained in the container, and  
means for detecting disconnection of said connection  
so that when a predetermined amount of said liquid has been dispensed from the container, an electric signal is generated in the detection means.

2. Apparatus as claimed in Claim 1 wherein the probe is provided with indices spaced longitudinally thereof.

3. Apparatus as claimed in Claim 2 wherein the probe comprises a tube of electrically non-conductive material and a terminal of electrically conductive material adapted to be inserted in an end portion of the tube remote from said end portion.

4. Apparatus as claimed in any one of the preceding claims wherein the detecting means comprises means for generating an audible alarm in response to said signal.

5. Apparatus as claimed in any one of the preceding claims wherein said detecting means comprises means for inhibiting flow of liquid from the container.

6. A probe for use in apparatus as claimed in any one of the preceding claims.

7. Apparatus for recording when a predetermined amount of liquid has been dispensed from a container substantially as hereinbefore described and as illustrated in the accompanying drawings.

8. A probe for use in apparatus substantially as hereinbefore described and as illustrated in the accompanying drawings.